### ETSF10 Part 2 Lect 1

Performance, UDP, TCP, Congestion Control (TCP), QoS

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# Today

- Performance
- Process-to-Process Delivery
  - Flows
- UDP

### Performance

- Bandwidth
  - In Hz (frequency band)
  - In bps (capacity)
- Throughput
  - How much of the link we can actually use
  - Includes congestion
- Latency/Delay
  - Propagation time
  - Queueing time
- Bandwitdh-Delay Product

### Bandwitdh-Delay Product

- How much data fills the link
- Important for example in congestion avoidance
  - Delay = Round Trip Time (RTT)
  - Go-Back-N can send more bits per RTT

#### Figure 3.33 Concept of bandwidth-delay product





## Process-to-Process Delivery

- Responsibility of Transport Layer
- UDP
  - User Datagram Protocol
- TCP
  - Transmission Control Protocol
  - Reliable connection
  - Congestion control

#### Figure 23.8 Position of UDP, TCP, and SCTP in TCP/IP suite







#### Figure 23.2 Port numbers







#### Table 23.1 Well-known ports used with UDP

Port	Protocol	Description
7	Echo	Echoes a received datagram back to the sender
9	Discard	Discards any datagram that is received
11	Users	Active users
13	Daytime	Returns the date and the time
17	Quote	Returns a quote of the day
19	Chargen	Returns a string of characters
53	Nameserver	Domain Name Service
67	BOOTPs	Server port to download bootstrap information
68	BOOTPc	Client port to download bootstrap information
69	TFTP	Trivial File Transfer Protocol
111	RPC	Remote Procedure Call
123	NTP	Network Time Protocol
161	SNMP	Simple Network Management Protocol
162	SNMP	Simple Network Management Protocol (trap)

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11	Users	Active users
13	Daytime	Returns the date and the time
17	Quote	Returns a quote of the day
19	Chargen	Returns a string of characters
20	FTP, Data	File Transfer Protocol (data connection)
21	FTP, Control	File Transfer Protocol (control connection)
23	TELNET	Terminal Network
25	SMTP	Simple Mail Transfer Protocol
53	DNS	Domain Name Server
67	BOOTP	Bootstrap Protocol
79	Finger	Finger
80	HTTP	Hypertext Transfer Protocol
111	RPC	Remote Procedure Call

 Table 23.2
 Well-known ports used by TCP



Error is checked in these paths by the data link layer Error is not checked in these paths by the data link layer



## Flows

- Flow concept increasingly important
   Multimedia
- All packets in flow take same path?
- L3/L4 switches switch on flows
  - Not on individual packets

### Flow definition

- Defined by
  - IP addresses
  - Ports
- Start and end of a flow?
  - TCP: Session setup and tear down
  - UDP: Session setup is natural.





